This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
1604 P43 1866 STOR
What effect has the meat or milk from di
24503451166

WHAT EFFECT

HAS THE

Meat or Milk from Diseased Animals

UPON THE

PUBLIC HEALTH?

[PRIZE ESSAY OF THE ALUMNI ASSOCIATION OF THE MEDICAL DEPARTMENT OF COLUMBIA COLLEGE, 1866.]

By SAMUEL R. PERCY, M.D.,

PROFESSOR OF MATERIA MEDICA IN THE NEW YORK MEDICAL COLLEGE; PHYSICIAN TO THE JEWS' HOSPITAL, ETC.

From Nos. XVI. and XVII. of the NEW YORK MEDICAL JOURNAL, Vol. III., 1866.

NEW YORK:
JOHN MEDOLE, BOOK AND JOB PRINTER, 193 PEARL STREET.
1866.

1604
P43
1866

P43
1866

LANE LIBRARY

LANE MEDICAL LIBRARY
15629
SAN FRANCISCO

EFFECTS

OF

MEAT AND MILK FROM DISEASED ANIMALS

UPON THE PUBLIC HEALTH.

Of all the subjects relating to the public health, there is probably none of equal importance to that which I here present, and I am aware that I have a very difficult task before me to give even an outline of an answer to the question. The very little corroborative evidence that we have upon the subject is so scattered and diffused through our medical journals, that it requires an immense amount of labor to collect a single fact. From the carelessness in investigating, or recording, much that is written cannot be accepted as proving any thing, and although to the writer's mind it may appear like evidence of facts, it must be taken by the reviewer as merely conjectural. No people in the world live so well or upon so diversified a diet as the people of the United States. With this varied and mixed diet that we eat, it is difficult to prove that any one thing injures us, and it is seldom that we have an opportunity to verify our suspicions of what we suppose to be unwholesome.

If we find that a person is made sick more than once by taking a certain article of diet, we may suspect the unwholesomeness of that article, and investigate its effects; or if a number of individuals are made sick by using the same food, we may fairly suspect its unwholesomeness. But neither of these instances come very frequently under the physician's

LANE LIBRARY

notice; hence the facts collected are few in number, and the danger in discussing the subject is that inferences will have too much weight. The students of *sanitary science*—for it has within the last few years become a *science*—have hardly studied this subject; they have turned their attention to other branches, and more particularly to that of the noxious influences of foul air from deficient systems of ventilation upon the public health and *morals*. In this latter study they have found numerous instances in which they have been able easily to trace the sickness to the cause producing it, and they have not been obliged, as in the question I now propound, to trace up with difficulty a few individual cases to their true source.

Again, in the adulterations and deteriorations of farinaceous food we have many learned investigators, and admirable and instructive works have been written pointing out these adulterations and the methods for their detection. But numerous as are the sophistications and degenerations existing in almost every article of vegetable diet, the injury that they produce is infinitely less than the deleterious effects produced by the diseased meat, milk and other animal products that are daily sold in our markets. The changes and adulterations that are so frequently made in our farinaceous food are, by study, easily discoverable by either the eye, the microscope, or chemical tests; but the flesh or milk of a diseased animal that will cause death, if eaten, from the existence of some organic poison, will show but little if any change that is perceptible to any of our senses, or be within the power of discovery by any of our tests.

The subject that I here present has been but very little studied in the United States, probably owing to there having been comparatively but little disease from this cause existing amongst us in comparison to that existing amongst the poorer population of Europe. The laboring population of this country live upon a substantial and nutritious diet, and are thus better able to resist the encroachment of diseases from organic poisons; and as their food is of a better character, it is less infested with entozoa and entophyta, so that we see less of parasitic development. But within the last few years, from immigration, importation, and other causes unnecessary to mention at this place, disorders produced from diseased animal products have

become very much more numerous, and the subject is assuming vast importance; and it is necessary that physicians must learn how to prevent, check or cure, and how to detect the diseases produced from these causes. *We need earnest and careful investigators in this almost untrodden field.*

To arrange and simplify the discussion upon "What effect has the meat or milk from diseased animals upon the public health?" we may divide the poisons from diseased animal products into three classes, viz.:

First Class.—Parasitic animals and vegetables inducing diseases in animals; and by means of the products of these animals so infested, communicating the same, or other, or consecutive diseases to man.

Second Class.—Gaseous, vegetable or mineral poisons, absorbed or taken into the system of animals, and so contaminating their flesh or milk as to produce disorders in persons partaking of either.

Third Class.—Animal poisons which render the flesh or milk of animals unfit for human food.

First Class.—There are numerous parasites which infest animals and man, which produce but little if any injury to the health of either; there are, also, entoparasites which have their nidus in certain animals, and so long as they remain in them continue in an imperfect state; but so soon as they enter the system of man, or some other animal, they undergo their last transformation and are developed into their perfect state, and abide for a longer or shorter time within their hosts, some varieties producing mere disturbance, some serious disorders, and some death.

Owing to the great facility with which the germs of some entozoa enter the intestinal canal of animals with the food, we find that many animals are infested with intestinal entozoa which remain only as intestinal entoparasites. The germs of other entozoa enter the intestinal canal with the food, and from thence penetrate through the living tissues, and make their nidus in the peculiar organ they select, reaching the tissues of their nidus entirely by the mechanical process of boring.

Of the ectoparasites infesting either man or animals it is unnecessary for us to speak at this time. Of the entophyta much might be said; we shall have in the present treatise a little to say of them in their proper place.

The entozoa at present known are very numerous, and helminthologists are constantly adding to our knowledge and classifying these parasites.[1] The "Entozoa Hominis" at present known are as follows:

Entozoa Hominis—	Found in the—
Ancyclostomum duodenale,	Duodenum and small intestines.
Ascaris alata,	Small intestines.
Ascaris lumbricoides,	Small intestines.
Bothriocephalus latus; B. Cordatus,	Intestines.
Cysticercus celkulosæ,	Areolar tissue of various organs.
Dactylius aculeatus,	Bladder.
Distomum hæmatobium,	Portal vein.
Distomum hepaticum,	Gall bladder and portal vein.
Distomum heterophyes,	Small intestine.
Distomum lanceolatum,	Hepatic duct.
Distomum oculi humani,	Capsule of crystalline lens.
Echinococcus polymorphus,	Various viscera.
Filaria bronchialis,	Bronchial glands.
Filaria medinensis,	Areolar tissue.
Filaria oculi humani,	Eye.
Hexathyridium pinguicola,	Ovary.
Hexathyridium venarum,	In the venous blood.
Monostomum lentis,	Crystalline lens.
Oxyuris vermicularis,	Rectum.
Pentastomum constrictum,	Small intestine and liver.
Spiroptera hominis,	Bladder.
Strongylus gigas,	Kidneys.
S. bronchialis,	In the bronchi.
Tænia nana,	Small intestine and liver.
Tænia solium,	Small intestine.
Tetrastomum renale,	Kidney.

[1] Leidy.

Entozoa Hominis—	Found in the—
Trichina spiralis,	Muscles.
Tricocephalus dispar,	Large intestine.
Tænia mediocanellata. T. acanthotrias, T. flavopuncta.	
Tænia marginata. T. elliptica.	

It is not intended in the present essay to treat on all these entozoa, but to confine the subject entirely to those that injure the flesh or products of animals, and thereby affect human life or health.

Trichina Spiralis; Thread Worm; *Flesh-Worm.*—The diseased condition of meat produced by this parasite has been but little thought of by the medical journalists of this country, but has been elaborately investigated in Germany, England and France.

The primary incubative state of this parasite is yet a disputed point with helminthologists, but its injurious effects to man are most frequently produced by eating the flesh of swine, though the trichina has been found in the flesh of beef, in moles, rats and mice. When this microscopic thread-worm exists in pork or other meat, it may be found in almost all the voluntary muscles of the body, being readily seen by the microscope in flesh of either the dead or living animal. If the invasion of the animal by the parasite has been recent, the entozoa will not be so readily distinguished as when the parasite has been longer within the muscles. Virchow states that it takes about three months for the trichina to arrive at that point of development to become encapsuled. The larvæ of this parasite is apparently sexless, but when the flesh of an animal containing it reaches the human stomach it almost immediately becomes active, and acquires sexual development. It is not oviparous, like the tapeworm, but is viviparous, and breeds multitudinous swarms of young trichinæ within the intestinal canal; these young trichinæ in a few hours perforate the intestines, enter into the blood vessels, and disseminate themselves to every part of the body, preferring as their habitat the voluntary muscles, though they have been found in the muscular structure of the heart. It is said by those who have diligently

studied their habits, that the imperfectly developed trichina, that is, those that have not existed long enough in the flesh to have become encapsuled, do not breed immediately upon entering the stomach as the encapsuled parasite does, but that some time elapses during which it becomes rapidly developed, and then its swarms of young are produced. It is the young trichinæ only that enter the muscles, the old ones die and are passed out of the intestines. The amount of irritation produced by their infusion always causes sickness and sometimes death. Numerous experiments have been tried upon inferior animals by feeding them with the flesh of animals containing encapsuled trichinæ, and in all instances young trichinæ have been found in the muscles of the animal so fed, both during life and after it has been killed.

These parasites are not destroyed in the flesh of a dead animal by freezing, drying, salting or smoking, nor by any thing but a thorough and perfect cooking of the whole mass. If the outside of a slice of such meat is well cooked the parasites in such parts are destroyed; but within, where the meat is underdone, they are still in a state fit for active development as soon as they reach the stomach of man or animals.

The symptoms produced in man by eating the flesh containing these parasites are peculiar and very painful. A few hours after partaking of a meal containing these trichinæ there is a sense of nausea; sometimes a portion of the meat is rejected by vomiting; generally there is diarrhœa, with gastric irritability and soreness over the whole abdomen. There is a feverish condition of the system, with general irritability and prostration. Soon there is soreness and pain over the whole body, the person is unable to keep still, but yet experiences soreness, pain, and lassitude in every movement. If the diarrhœa has been early and profuse, the symptoms are not generally so severe as where there has been no diarrhœa, as undoubtedly by this discharge myriads of trichinæ are expelled, leaving fewer to enter the muscles. The after symptoms of those who have no diarrhœa are generally more severe, and more of such patients die—sometimes after a few days, and sometimes after weeks of lingering sickness. In the early stage of their invasion the trichinæ enter the muscular fasciculæ, and to some extent

destroy the striated muscular fibres; after a period of about three months they become encapsuled, and remain in this state for many years. In the encapsuled state the parasite seems to remain dormant, and inflicts no further injury upon its host; but if the flesh containing it is eaten by another animal, broods of young trichinæ are at once developed in its stomach, and again find their nidus in the muscular structures. It has been ascertained that they may exist in this encapsuled state during the lifetime of their host. The following instance in point is highly interesting:

"Virchow cites one striking instance which exemplifies, in the clinical experience of one person, the history of trichinæ disease from the time the subject of it first became so. Last summer a person (the instance referred to) was being operated on by a noted surgeon of Berlin for swelled neck. During the operation the bared muscles were seen to be filled with the characteristic shells or cysts of trichinæ, which can be recognized with the naked eye. The patient related, in reply to a question whether he had ever been very sick, that in the year 1815, with the other members of a commission for the inspection of schools, he ate a meal of ham, sausage, cheese, etc., at an inn. All who ate of these provisions were soon after taken sick, and, except the relator himself, died. Suspicion fell on the innkeeper. A judicial investigation was held, but without result. Here the survivor might have gone to his death, and yet nothing have ever been known in his particular case of the infestation by trichinæ which had killed his six associates, although he survived, had it not been for the knowledge of the animal that science had gained years after the fatal meat was eaten."[1] Many similar instances of such poisoning are recorded throughout Germany before the trichinæ was known, and in most instances the cause of death or sickness was attributed to ham poisoning.

A well marked instance of trichina disease occurred in the city of New York a few years ago. A whole family had eaten of a ham purchased in Grand street, and a few hours after they were taken with nausea, vomiting, purging, soreness and

---

[1] American Medical Times, April 10, 1864. Dr. P. K. Brown.

prostrating sickness. They supposed they had been poisoned. Drs. Schnetter, Jacobi and Valliere were called, recognized the disease, and treated it scientifically. One of the children died, and a post mortem examination was held. Trichinæ were found in the muscles. The ham was examined by the microscope and found to be filled with trichinæ. A portion of the ham was given to me by Dr. Schnetter, and although I could not see any trichinæ with the unaided eye, I found them in very large numbers with the microscope, most of them encapsuled. Dr. Schnetter also found trichinæ in the muscle of one of the living patients. The remaining members of this family, though sick for some time, have, to a great extent, recovered their health.[1]

It has been supposed by many persons that trichinæ exist only in swine, and that man always derives them from this source; but several helminthologists have proved that they exist also in the mole, the rat, and the mouse, and there have been cases of the symptoms of trichinæ poisoning in man from eating the *flesh of beef cattle.* There is, I think, but little doubt that beef cattle are frequently infested with trichinæ, and when we consider the way in which many of our beef cattle are fed, it would seem strange if they were entirely exempt from the disease. Virchow has demonstrated that they may exist in cattle, if swine flesh infested with trichinæ is fed to the cattle. The following case came under my observation during the past winter.

A family, consisting of father, mother, and four children, all in perfect health, partook of dinner consisting of bread and roast beef only. About fourteen hours afterwards all the children were attacked with vomiting and purging, abdominal pains and irritative fever. I saw them about sixteen hours after. They had eaten nothing since; they all complained of great soreness in the abdomen; the pulse was quick and small; the skin was hot and dry, and there was great prostration. I gave each of them a full dose of castor-oil to fully remove the offending matter, and allowed them weak brandy and water to

---

[1] Transactions of N. Y. Academy of Medicine, vol. iii., parts one and two. J. C. Dalton.

drink, as they were very thirsty. I learned that they had eaten nothing at or since dinner but meat and bread; the bread was home-made and such as they had eaten the day before and the meal previous. The mother said she always cooked her meat rare, as she thought it more nutritious, and they liked it better, and this piece was rather rarer than usual. The father liked his meat well done, and had eaten both of the outside pieces; he was not sick. The children were sick and confined to their beds for several days, complaining of great soreness and general malaise. The mother had no sickness or diarrhœa at the time of eating the meal, but on the fifth day after she was taken with faintness and diarrhœa, and she suddenly miscarried at about the third month of pregnancy. The attendant threw away the fœtus, so that I had no opportunity to examine it. I examined a portion of the placenta, in which I found a few trichinæ. I examined a small piece of the beef of which they had all eaten, and discovered trichinæ in it, but nothing like in such numbers as I have found in pork. It has also been examined by one of our most celebrated microscopists, Mr. Gavit, and preparations made of it. I have no doubt that they existed in the fœtus more abundantly than in the placenta, and were the cause of the death of the child and its abortion. We know that young pigs are infested with cysticerci cellulosæ, whose dams are diseased with measles. I took pains to ascertain where this meat was purchased, and I found they had obtained it from a small butcher in the neighborhood; he told me he had purchased a quarter at Washington Market and upon inquiry of the person whose name he gave me I learned that it came from the distillery stables at Newtown, Long Island.

It seems to me more than probable that many of the cows in these distillery stables are infested with trichinæ. We have before stated that they have been frequently found in rats and mice. The numerous rats and mice living about these stables are probably more than usually omniverous. They frequent the thickly settled shanties and pig-pens of the attendants around these distillery stables, and they swarm in the troughs of these swill-fed cattle, leaving quantities of their excrements behind them, which are eaten by the cows, and if, as is more

than probable, that trichinæ exist in the excrements, the cows must become infested with them. I have never heard of this kind of beef being examined with reference to the trichinæ, and the instance I have quoted is the only one that has come under my knowledge. It is no proof that it does not exist amongst these cattle because physicians have not seen and reported cases of such poisoning. This disease is not well understood by the majority of physicians, and its study is of modern date amongst us, and, in consequence, numerous cases of poisoning by trichinæ in pork and beef are overlooked and attributed to some other cause. Of the cases above reported, it will be seen that the father who ate the well cooked portion of the beef escaped without any sickness, but that every other member of the family suffered severely, and the mother lingered almost to the point of death for many weeks, and has not been well since.

There are numerous well authenticated instances of poisoning by this parasite in the European medical journals. The following, from the *British Medical Journal* of January 16, 1864, is perhaps the most fatal of any recorded: "A few months ago there was a festive celebration at Hettstadt, a small country town near the Hartz Mountains, in Germany. One hundred and three persons sat down to dinner, and having enjoyed themselves *more majorum*, separated and went to their homes. Of these one hundred and three persons, mostly men in the prime of life, eighty-three are now in their graves; the majority of the twenty survivors linger with a fearful malady, and a few only walk apparently unscathed among the living, but in hourly fear of an outbreak of the disease which has carried away such numbers of their fellow-diners. They had all eaten of a poison at that festive board, the virulence of which far surpasses the reported effects of aqua tophana, or the more tangible agents described in toxological text-books. It was not a poison dug out of the earth, extracted from plants, or prepared in the laboratory of the chemist. It was not a poison administered by design or negligence; but it was a poison unknown to all concerned, and was eaten with the meat in which it was contained, and of which it formed a living constituent. The remnants of sausage and of pork employed

in the manufacture of the *röstewurst* (a dish which formed the third course of the dinner) were examined with the microscope, and found to be literally swarming with encapsuled trichinæ or flesh-worms. From the suffering muscles of several of the victims small pieces were excised, and under the microscope found charged with embryonic trichinæ in all stages of development. It could not be doubted any longer that as many of the one hundred and three as had partaken of the *röstewurst* had been infested with trichinous disease by eating of trichinous pork, the parasites of which had, at least in part, escaped the effects of smoking and drying. This awful catastrophe awakened sympathy and fear throughout the whole of Germany. Most of the leading physicians were consulted in the interest of the sufferers, and some visited the neighborhood where most of the afflicted patients remained, but none could bring relief or cure. With an obstinacy unsurpassed by any other infectious or parasitic disease, trichiniasis carried its victims to the grave. If it be remembered that one ounce of meat filled with trichinæ may form the stock from which in a few days three millions of worms may be bred, and that these worms will destroy in the course of a few weeks not less than two millions of striated muscular fibres, an idea of the extent of destruction produced by these parasites can be formed. Most educated people in Germany have, in consequence of the Hettstadt tragedy, adopted the law of Moses, and avoid pork in any form."

As this trichina disease is but little understood in this country, an abstract of a most interesting case, given by Dr. N. Friedreich, of Heidelberg (Virchow's Archiv. Band xxv. Hefle iii. and iv., p. 399), will be especially instructive, and will well repay a careful study.

"G. M., a robust, healthy man, æt. 22, whose trade brought him into connection with sausage meat, pig's meat, etc., had been working very hard, when suddenly he experienced an excessive weakness in the legs, and excessive painfulness in the muscles. This was accompanied by headache, heat of the surface, thirst, anorexia and sweating. These symptoms increased, and shortly afterwards diarrhœa and considerable pain and stiffness in the muscles of the arms, loins and back came on. No lung symptoms or vertigo existed.

"When first seen at the hospital, April 24, the pain in the muscles of the limbs and neck was very great, especially on pressure. The muscles had a hard, tense, india-rubber like feeling, and were very turgid, and attempts to raise himself in bed produced great pain and stiffness in the back. Power of swallowing, chewing and speaking was unaffected, and the tongue appeared normal in every way. The abdomen and its organs, as well as those of the chest, appeared natural. Well marked febrile symptoms afterwards came on, with headache and vertigo, thirst, loss of appetite and furred tongue. At first there was no albumen in the urine. There was delirium, restlessness and diarrhœa; then intense debility and epistaxis. The pupils remained natural; special senses natural. Subsequently diarrhœa, with many portions of *tænia* evacuated. The pain and soreness of the muscles increased, and uprising in bed became impossible. The elbow joints became somewhat flexed, and much pain was felt on attempts to straighten them; the lower limbs were outstretched. The sweating became profuse, then hoarseness and some dry cough came on, with pain on speaking. The headache and thirst then became less. No exanthematous rash or any enlargement of the spleen existed, but a slight amount of albumen was then found in the urine. During most of this period (ten days) the pulse ranged from 100 to 114. Subsequently loose stools were passed, and about this time the pulse became rather lower, but the weakness and pain of the muscles continued to increase. The sweating continued, and much miliary eruption, containing clear fluid, existed on the skin, but nothing like roseola; afterwards numbers of small pustules, filled with a milky fluid, and surrounded with a red basis, arose on the breast and abdomen. Slight diarrhœa continued. The patient then had *picro-nitrate of potash* administered three times a day. The pimples and pustules extended over the back, the urine became free from albumen, the tongue natural, headache disappeared, and sleep and appetite became natural. A minute portion of the muscle was then extracted, by means of Middledorpf's harpoon, from the calf of the right leg, and in the portion removed, which was hardly the size of a hempseed, seven partially spiral trichinæ were counted between the muscular fibres. The picro-

nitrate of potash was continued. On 9th May the pain and soreness of the muscles had somewhat diminished, especially in the arms; movements and sitting up in bed were also easier, but the tense state of the muscles continued, and also the contracted state of the elbows, but attempts to straighten them were less painful. The sweating and vesicular eruption continued, and in addition large pustules, the size of a hempseed, with red circumference, came out in different parts; a black spot showed itself on the right side of the back, which was very painful and surrounded with dark redness; in the neighborhood of this was a boil of the size of a pea, from which, on pressure, a quantity of brownish pus was squeezed. On examination of this purulent matter, in addition to pus-cells, blood-corpuscles, dead connective tissue, etc., *a large, well developed trichina was discovered.* Œdema of the ankles came on. An improvement took place in the condition of the muscles as respects stiffness, tension and pain, and also in the contraction of the elbow. The miliary and pustular eruption continued in fresh crops, and a small, very painful boil came out over the right clavicle. The black spot on the back had left behind a clear ulcer. The conjunctiva and skin of the body were colored of a yellow hue by the medicine. The symptoms continued in all respects to improve, but still a little albumen remained in the urine, which had become very dark colored by the medicine, which was continued. After a time fresh crops of eruptions ceased to appear, the ulcer of the back healed, the sweating became less, and the general health improved vastly.

"No trichinæ were found on a second exploration of the muscles of the leg with the harpoon; but on a third and later operation *a living trichina, not yet encapsuled, was discovered.* The medicine was discontinued for a time, when the yellow color of the urine and conjunctiva diminished quickly. Again a portion of the muscle of the leg was removed, without any traces of trichinæ being found; but at a still later exploration the parasite was met with. On 30th June the patient left the hospital, feeling well."

In commenting on the details of this case the author notices the absence of chills in connection with the commencing febrile symptoms, and draws attention to the *course* of the symp-

toms, the muscles of the legs becoming affected prior to those of the arms and back; and also during recovery the improvement in the legs taking place last of all—the legs being to a certain degree affected for a length of time after the other limbs had returned to their natural state. These symptoms are referred to irritation of the sensitive muscular nerves and hyperæmia, with convulsive excitation of the muscular tissue, brought about by the presence of the young trichinæ—the microscopical examination of the muscular fibre removed by the harpoon, more or less in a fatty condition, indicating a regressive disturbance of nutrition. The hoarseness is attributed to the presence of trichinæ in the muscles of the larynx. Observations have been made by Bischoff, Henle, Virchow, and Leuckart, as to the presence of these parasites in this part. The persistent diarrhœa may be attributed to irritation of the intestinal mucous membrane by the trichinæ, but the stools were not examined by the microscope. The excessive sweating is to be associated with a determination of blood to the vessels of the skin, owing to the hardness of contraction of the muscles, and seems comparable to the profuse sweating of tetanus.

The author also looks upon the case as proof of the existence of a trichinous "pustulosis and furunculosis," and explains the abscess of the side of the chest, in which the trichinæ were found, by supposing that the parasite had escaped from the muscle into the subcutaneous tissue, and set up inflammation—noticing the preference which (as has been shown by other observers) the parasite shows for the muscles of the thorax, and for peripheric or superficial parts.

As respects diagnosis of trichinous poisoning, the disease is to be known from acute rheumatism by the *extent* over which the muscular pain exists, also by the freedom of movement of the joints; from tetanus by the absence of trismus, and of the exaltation of reflex action; from typhus by the absence of cœcal pain, of enlargement of the spleen, of the special eruption, of the dry tongue, and of the head and lung symptoms. It is also to be observed, in this instance, that the patient had been latterly engaged in the killing of pigs, often placing the bloody knife in his mouth, and eating portions of the uncooked meat.

As respects the therapeutic bearing of the case, it seems that Friedreich was induced to try the picro-nitrate of potash from having previously observed the manner in which, when given as a substitute for quinia in ague, it quickly tinged the conjunctiva and skin of yellow color. Supposing it must have the power of coloring human tissues, he was led to give this intensely bitter remedy, with a view to its immediate action upon the trichinæ whilst yet existing in the intestinal canal.

Too much confidence must not, I think, be placed in this remedy of Friedreich's—the picro-nitrate of potash; for it will be remembered by those who have studied this disease, that after the trichinæ become encapsuled there is a gradual amelioration of all the symptoms, and it will be seen that at his last exploration the parasite was still met with.

Friedreich has not examined the patient since to ascertain if the trichinæ are still to be found; should he do so, probably the result might be like that recorded in the following case: "While removing a cancroid growth from the neck of a patient, arrived from the country, Dr. Langenbeck remarked that the platysma presented an unusual appearance. Microscopic examination showed that it contained an immense number of dead trichinæ, contained in calcified capsules. Inquiry was made as to the circumstances under which the immigration had probably occurred, and the following was the result: In 1845 a commission, composed of eight persons, went to a town, in the district of Lansitz, to inspect the schools. A collation composed of ham, sausages, cheese, roast veal, and white wine having been served to the commission, only seven of the members partook of it, the eighth was absent at the time, and only took a glass of red wine at the dessert. Three or four days afterward the seven who had partaken of refreshments were seized with intense diarrhœa, pain in the neck, and œdema of the face and extremities. In four the attack proved fatal, and three others, including the individual on whom M. Langenbeck had operated, only recovered after a tedious illness. Rumors of poisoning spread about, as may readily be imagined. An investigation was ordered, but the result was negative; the public, however, did not so readily get quit of their suspicions, and the landlord of the hotel, where the collation had

been served, soon found himself without customers and obliged to emigrate." (Deutsche Klinik.) There are other cases reported equally as corroborative as this of the deadly poisonous invasion of the trichinæ, of the ultimate recovery of the patient, and the discovery of the parasite in the muscles after a lapse of many years. The trichinæ, in most of these cases reported, were still in a living condition, and ready for remultiplication if the necessary nidus were only furnished them.

There are numerous cases of trichinæ poisoning now recorded in the European Medical Journals—in fact, in some parts of Germany so many persons have been attacked with it that the disease has been incorrectly called " epidemic."

The trichinæ are not destroyed by either salting, drying or smoking meat containing them. Some helminthologists have asserted that it is destroyed by a temperature of 145°, F., but I think that this must be a mistake, and I believe it requires a heat but little below boiling point (212°, F.) to destroy its vitality. One person whom I know, who was poisoned by eating a boiled ham containing them, said that the meat did not appear to be underdone. Several persons who were poisoned by them from eating a boiled ham on board one of the European steamships, said that the ham appeared to them to be but little underdone, yet living trichinæ were found in the muscles of some of these individuals by Dr. Voss of this city. The beef that I before spoke of, containing trichinæ, did not appear to be very rare. It is, of course, difficult to arrive at any facts as to the amount of heat to which the inside parts of a ham are subjected by boiling the whole ham, yet it would appear as though all parts of it must have been subjected to a higher temperature than 145°, F., in boiling the whole ham, and giving it the external appearance of being cooked. The only safe preventative against poisoning from trichinous flesh is by thoroughly cooking every portion of it.[1]

Tænia Echinococcus; Echinococcus Polymorphus; Tænia Granulosa.—Although this parasite is exceedingly destructive

---

* For a full description of this parasite, and a number of most accurate microscopic drawings, see Professor J. C. Dalton's "Observations on Trichinæ Spirales," in the Transactions of the N. Y. Academy of Medicine.—Vol. iii., parts 1 and 2.

to human life in some parts of the world, we are but little acquainted with it in this country, and cannot therefore speak of it from personal experience. What little we have to say of this entozoa is condensed from European medical journals.

In its perfect state this parasite is a small tapeworm, which lives in the intestines of the dog; it is about one-sixth inch in length, with four joints and a single head, armed with four suckers and a double crown of hooks. In this, its perfect condition, it is very small, but in its larva or hydatid state it grows from the size of a grape to that of a man's hat. In its hydatid condition it infests man and domesticated animals, and presents an aspect not unlike the toy air-balls with which children play. It is furnished with hundreds, sometimes with thousands of heads, each one of which is capable, under favorable circumstances, of becoming the perfect small tapeworm.

"It is in Iceland that the saddest experience exists as to the alternate generations of the tapeworm. There the diseases which are due to the various stages of various kinds of tapeworm prevail to an enormous extent, among both men and cattle. Dr. Arthur Leared says, on the authority of Dr. Hjaltelin, of Reykjaoik, that a fifth part of the human mortality in Iceland is caused by hydatid disease. And how great is the influence which the dog exerts as an intermediary in propagating such disease, cannot be better illustrated than by the fact of Dr. Leared's having suggested, as one of his two measures for preventing the human hydatid disease, that all the dogs of the island should be medically treated for tapeworm. The evidence against the dog in this matter (says Dr. Leared) rests upon numerous experiments, conducted under circumstances leaving no doubt that tapeworms were produced by feeding them on fresh (hydatid) bladders. The conditions necessary for the propagation of the worm are nowhere so complete as in Iceland. The farmers kill their own meat, and the offal frequently containing living (hydatid) bladders is the food of dogs. Abundance of mature worms are thus produced. Again, the whole country is one vast pasture, and dogs are universally employed in managing the sheep. These dogs shed everywhere segments of tapeworms, the eggs from which are diffused by rain and melted snow. Each segment is filled with innu-

merable eggs, invisible to the unassisted eye, which are not set free in the intestine of the dog, but in the outer world, by the decay of the case containing them. It is impossible to say to what extent these eggs preserve their vitality, but so resistent is the outer shell that I have found them, by examination with the microscope, quite intact after having been steeped for twelve hours in strong sulphuric acid. It seems that desiccation is most fatal to their vitality, and there can be no doubt it is for this reason that sheep are much less liable to staggers in dry seasons, and on high grounds, than when the season is wet or their feeding grounds are low and damp. These eggs, finding their way into drinking water, or adhering to articles eaten raw, as bilberries, or the stalk of the angelica, are swallowed by men. The hands are even liable to be infected by contact with the grass, so that the eggs may easily be swallowed with ordinary food, or from casual application of the hand to the mouth." The plan which Dr. Leared recommends is that all the dogs of Iceland should be treated at the same time with doses of kamala, an Indian vegetable drug, which is a cheap, tasteless and efficient remedy against tapeworm.

One-fifth of the annual deaths among the population of Iceland is owing solely to this echinococcus disease; and the Icelandic physicians calculate that there are at least 10,000 patients under treatment at the same time for this entozoic poisoning. This is truly appalling.

The question has been frequently asked, by a thoughtless public, what has this to do with diseased meat? It appears that the disease which carries off so many human beings annually is caused by the eggs of a small tapeworm which infests the dog, and developes only to its larval state in man; human beings don't eat dogs! No, but dogs eat meat which is infested with the larvæ of this parasite, and thus keep up the chain of "alternate generation." Man suffers equally with animals; in fact, from his delicate nervous organization, more than they. We here, then, have proof equally as strong as in trichinous poisoning, that man's life is sacrificed by diseased meat—diseased because infested with parasites. It is said that this disease does not exist in this country. I think it would be more

safe to say that it has not been recognized; but even if it does not, we do not know how soon it may be before we may be called upon to treat it, and find some remedy for it. We have sporadic outbursts of a disease called *spotted fever;* it has not been recognized as an entozoic disease, and yet I venture the assertion that it will yet be proved to be such. I make this assertion from the symptoms, not from having recognized any entozoon.

Cysticercus Cellulosæ; Bladder Flesh-Worm; Measles of the Pig.—This animal parasite infests the muscles of all parts of the body of the pig, but is found most frequently in the muscles of the tongue, loin and neck; occasionally it is seen in the muscular substance of the heart. "It is seen as an ovoid bladder, from two to four lines in length, formed by a thin transparent membrane, and inclosing at one extremity an opaque body of a white color. This is the worm coiled up, but which, when unfolded, exhibits a head, neck, and pear-shaped vesicular tail. The head is armed by a crown of barbed hooklets, around which are placed four sucking mouths, and the neck is formed of a series of rings, which gradually loose themselves posteriorly on the dilated and bladder-like tail. In the interior of the worm are a number of microscopic corpuscles. The average diameter of these bodies is $\frac{1}{1500}$ of an inch, and their usual form that of a flattened circular disk, but they vary both in form and size. During the life of the pig the bladder inclosing the worm is fully distended with a pellucid fluid, but after the pig's death a portion or all of the contained fluid escapes into the surrounding tissues."

It has been proved by studious and careful helminthologists that this cysticercus is the scolex or imperfect parasite of the tapeworm, *tænia solium*, and that when a living cysticercus reaches the intestines of man and of some other animals it becomes developed into its perfect state, the tænia solium; that it may remain for an indefinite length of time within the intestines of its host, producing eggs which are passed out with the feces, and are again developed as cysticerci if they are taken into the stomach of swine. Experiments have also been made showing that the cysticercus is developed in the muscle of the pig if it is fed with the egg-bearing joints of the dog tape-

worm, the *tænia serrata*, and that this tænia serrata is found in the intestines of the dog that is fed on measly pork; but that the cysticercus is not generated in the muscles of the dog by feeding it upon the eggs of the tænia solium or serrata. After a certain time each joint of the tænia contains many thousands of eggs, and these are voided by the dog and by man in large numbers; they are so small that when dry they appear as fine dust, and are thus easily mixed with the food of the pig, and thus become converted into cysticerci. Where the pigs and dogs run at large around the houses of the peasantry, the pig devours the excrement of both man and the dog, and undoubtedly in this way frequently becomes measled. The tænia solium is not at all uncommon in inhabitants of this city, and although I have not found the cysticercus in man, there are numerous instances throughout the European medical journals where the cysticercus has been found in the brain, the eye, and in several of the muscles of man.

When pork is what is called "but slightly measled," that is, when but few of these parasites are scattered throughout the body, the parts of the flesh not infested do not differ in appearance from healthy pork, and no change is discovered upon more minute examination; but when the cysticerci exist in large numbers and are thickly scattered throughout the muscles, the whole flesh has a diseased appearance, being watery, soft and pale, and upon minute examination exhibits the condition known as fatty degeneration. If an animal in this state is not killed it soon dies from general fever and debility.

Leuckart has traced in the rabbit the passage of the embryo tapeworm into the blood vessels. The eggs are quickly hatched in the stomach, and the young tæniæ bore their way with their lancet armed heads through the mucous membrane into the blood vessel. With the blood, they are carried in the rabbit to the liver, to be there arrested and developed into the hydatids or cysticerci. In the lamb, the young tæniæ are carried with the blood to the brain, where they fix and grow into the cystic parasite named *cœnurus cerebralis*, and within two weeks of the commencement the lamb is affected with the "staggers." Kuchenmeister says that the hydatid in the brain of the sheep and lamb which causes the "staggers" is the embryo of a tape-

worm, also inhabiting the bowels of the dog, and known as the tænia cænurus. But Fleming says, "the cystic entozoa or hydatids do not form a separate class of parasites, but are merely the cestoid entozoa or intestinal worms in an imperfect state. Each species of tapeworm has its corresponding cyst-worm; but the same embryo tapeworm may produce two or three forms of hydatids, according to the species of animal and part of the body in which it may chance—or rather, I should say, mischance—to be developed, for the hydatid is essentially abnormal both in form and size, and these entozoa obtain their perfect growth only in the intestinal canal, their proper dwelling-place. The young tapeworm, swimming in the blood, is fixed probably by getting into a capillary too small for its passage; and the reason of its being arrested by preference in the muscle of the pig, brain of the sheep, and liver of the rabbit, may perhaps be found in the relatively small size of their capillaries."

Cystic entozoa have been found in the flesh of nearly all animals.

The *tænia solium* undoubtedly is most frequently developed in man from eating meat in an uncooked or raw state, and it is asserted by many authors that the cysticercus is destroyed in the process of salting and curing; but it must be remembered that but very few persons ever eat raw pork until after it has been salted, and at least partially dried and cured. Proper cooking undoubtedly always destroys the hydatid; but I think we have evidence that meat which has been salted, cured and cooked to a moderate extent will still produce living tæniæ if eaten. There are many such cases on record. I can also give one from my experience within the last few months. During the spring of 1863 a gentleman of New York sailed for Liverpool. Upon his arrival he ate very heartily of boiled ham; a gentleman who met him at the hotel, pointed out to him in this ham numerous spots of measles, and told him he would be troubled with tapeworm. He remained in England some months, and when he returned home came to me complaining of all the symptoms of tænia, and stated that he had occasionally passed a few joints. I gave him some kousso; he brought me about three feet of tænia, but it evidently was but a part, not a whole of the entozoa.

But as he felt easier he took nothing else until last March, when he again complained of worse distress and pain than ever. I gave him a mixture composed of one ounce of peeled pumpkin seed, made into an emulsion, to which I added a scruple of cowage and half an ounce of spirits of turpentine. This was given after fifteen hours' fast, and was followed in two hours by a brisk purge of compound jalap powder. This expelled thirty-one feet of tænia solium—evidently the whole worm. He has not had a sick day since. In this parasite, then, as well as with the trichinæ, it is necessary to cook the meat most thoroughly to prevent infestion.

No prudent individual, in view of the facts here presented, would ever eat "measly" pork, however slightly diseased; nor do I think that any well informed and prudent physician will deny that such meat is unwholesome food for man.

As my time is very limited I cannot, at present, state more in detail the various *parasites* that infest the flesh of the animals upon which we live, and in turn colonize the human body with the same or lower forms of larval animal life, producing disease in all instances, and frequently death. We have seen that the minute trichinæ, too small to be detected by the unaided eye, inhabiting the flesh of swine and of beef, infest the human muscles, and cause severe, and prostrating, and painful sickness if but a few of the parasites reach the human stomach from the meat, and that where they are swallowed in large numbers death is nearly always the result.

The small tænia echinococcus, in its perfect state, becomes, in its larval state, a large cyst; and, as we have shown from the statements of watchful helminthologists, ten thousand persons are sick at the same time with this disease in Iceland. The cysticercus cellulosa, the larva of the tænia solium, infests the flesh of the pig and other animals, which, in its turn, by alternate generation, diseases man. The same may be said of the effects on horned cattle of the larva of the *tænia medio-canellata* and *tænia marginata*. The brain disease of sheep and lambs is produced by the larva of the tænia cænurus. The disease in the livers of the same animals, usually called the "rot," is due to numerous adult oviparous fluke-worms; the distoma and the strongylus cause disease of the lungs in calves and lambs.

Although in some of the latter of these we cannot yet plainly point out the "alternate generation," we know that the flesh of animals infested with these entozoa is unwholesome as human food. "And although this opinion may be assailed on the ground that bad meat is consumed to a large extent, and that no hurtful effects have been traced to its employment, we cannot trust to common experience in a question of this nature. Putting aside the ordinary sources of fallacy, the poor consumer of such meat is rarely capable of tracing the relation of cause and effect between bad food and its evil consequences. He would conclude meat to be wholesome which failed to produce some striking bad symptoms soon after a meal, and would be unable to refer to its true cause the injurious influence, slowly and silently, but not less certainly, wrought upon the system by the long continued use of an unwholesome article of diet."

Of the microscopic appearance of these entozoa, Mr. Quekett, in his "Lectures on Histology," gives the following descriptions: "The entozoa are divided into four orders, viz.: cystica, cestoidea, trematoda and nematoidea, and the skeleton, if such can be said to exist, certainly belongs to the dermal class. In the cystic order the structure of the tegument or wall of the cyst is minutely granular, but in its higher state of development, as in cysticercus, it consists of fibrous tissue.

"In the genus cænurus the cyst is granular, but in echinococcus the young frequently found within the cyst or body of the parent are each provided with a crown of hooks of peculiar figure; the same kind of hooks, but on a larger scale, are met with in adult individuals of the genus cysticercus and cænurus.

"In the cestoid order, which includes the 'tapeworms,' the body consists of a series of joints, each of which is composed of a fibrous tissue, and incloses a distinct vascular, digestive, and generative apparatus. The head of the tænia solium or common tapeworm is surrounded with a crown of hooks, but, although larger, they are not so numerous as those of the young of the echinococcus.

"In the order trematoda, which may be represented by the fluke, inhabiting the ducts of the liver, the external tegument is principally composed of a soft fibrous structure, sufficiently

transparent to allow of some of the viscera being seen within. In the planariæ, which resemble the distoma in external form, the integument is capable of considerable elongation.

"In the last order, nematoidea, in which the articulated character arrives at its highest state of perfection, we have also the well developed dermal skeleton; in some of the large round worms, such as the ascaris lumbricoides, the integument is of a horny nature, and when viewed under the power of 250 diameters is found to consist of a series of rings, or bands of transparent elastic material, exhibiting short fibres, crossing each other at various angles; so elastic is it that when every trace of muscular tissue is removed, there is an evident tendency in it to resume the cylindrical form it originally occupied."

Before closing this first class of the subject I have undertaken to discuss—the influence of parasites in the production of disease—I ought to give a description of the flora within animals, but I feel that I have not as yet studied the subject sufficiently to speak authoritatively upon it. That vegetable parasites—ectophyta—frequently infest cattle and produce disease on man we have many instances, the most frequent of which is the "ring-worm," affecting cattle, which produces eruptions and boils on the hands of persons who clean them, or who dress their skins. These sores and eruptions are caused by the vegetable parasites *trycophyton tonsurans*. But any description of the *ectophyta* is beyond our province, as we must confine ourselves exclusively to the effects produced by diseased meat and milk.

Fasciola Hepatica; Distoma Hepaticum; Liver Fluke, the most common of the liver entozoa of sheep, cattle and other herliverous animals; the Rot.—The fluke is the most common of all the known existing species of trematoda. The number of existing species is very large. In a most elaborate and lengthened paper in the fifth volume of the "Journal of the Proceedings of the Linnæan Society," entitled a "Synopsis of the Distomidæ," by T. Spencer Cobbold, M.D., he recognizes 344 different species of flukes; of these, 126 are proper to fishes, 108 to birds, 47 to reptiles, 58 to mammalia, and 5 to non-vertebrate animals.

The flukes are small parasites, generally visible to the unaided eye, some not exceeding one-hundredth of an inch in longitudinal diameter, but many of the species from one-quarter to one-half an inch in length. The species we are here considering, the fasciola hepatica, seldom exceeds an inch in length, and the majority found are not more than half that length. There are four known varieties, very much larger, varying from three to five inches in length; but of these we need not speak, as they are not parasites within animals whose flesh we eat.

These flukes enjoy the privilege during a portion of their existence of making for themselves a home in the interior of the bodies of living animals, but they are not parasitic during the whole period of their existence; for while passing through the cycle of their life development, they are found during their earliest period in ponds, brooks, moist places, low pasture grounds, on the leaves of grasses and weeds that are kept moist by water or dew. In a further period of development they attach themselves to the body of a slug, pond snail, tadpole, or some aquatic insect, and bore themselves within to the viscera of their hosts. In this state they frequently migrate from the body of their host and become capable of an independent existence. They are taken into the stomachs of sheep, cattle, etc., either by the animal drinking water, or eating grass or vegetable food, or swallowing the soft body of some aquatic insect containing the parasite. Upon entrance into the digestive organs of cattle, the cercariæ bore their way after a time into the liver, where they become encysted and remain for weeks or months, perfecting their development, until they arrive to the sexually mature fasciola hepatica. When fully arrived at its state of perfection, it bores its way into the ducts of the liver, passes down the ductus communis choledicus into the intestines, and is thence expelled from its vertebrate host. Its eggs are deposited upon the moist ground or upon growing vegetables.

These parasites are sometimes very numerous in the livers of sheep found in this market. I have seen fifteen sexually mature animals within the liver of one sheep. The animal was in a sickly condition and could not have lived long—its whole carcass had a diseased appearance, but it was sold for human

food. The parasite is more frequently found in the spring, and when the spring is very wet, fearful mortality frequently occurs amongst sheep from this cause. Dr. Cobbold says, "This litt'e entozoon, more powerful for the destruction of its friends than our huge armaments for the annihilation of our enemies, destroys in England alone some tens and even hundreds of thousands of sheep annually, besides afflicting in a lesser degree the larger cattle—added to which, our own viscera are sometimes deemed worthy of a visit." In some years, in England, over 2,000,000 of sheep have been destroyed by this parasite, and this does not include the numbers that are killed and sent to the meat market to prevent a total loss to the pockets of the owners. As we in all American cities virtually have no system of meat inspection, it is impossible to ascertain the effect that this large amount of diseased meat has upon the public health.

Innumerable diseases are undoubtedly engendered by the use of diseased meats, which might be prevented if the subject that I have opened for discussion were properly understood; but great difficulties stand in the way of acquiring a deep knowledge upon the subject. No assistance of any kind is afforded to those who would elucidate the subject, the whole expense of procuring animals or meats must be borne by the student himself, and there are no societies to afford him any encouragement or assistance; his progress, unless he has abundance of means at his disposal, which, unfortunately, is seldom the case, must necessarily be slow. In Europe the governments foster and furnish the means to prosecute such researches.

I have before spoken of the "Synopsis of Distomæ," by Dr. Cobbold; the conclusions to which he has arrived as to the development and transformations of the common liver entozoon of cattle may thus be summed up:

1. The fasciola hepatica, or sexually mature liver fluke, is especially prevalent in sheep during the spring of the year, at which time it constantly escapes from the alimentary canal of its host and is thus transferred to open pasture grounds.

2. It has been shown by dissections that the liver of a single sheep may, at a given time, harbor several dozen specimens of

the fluke; and it is certain that every mature entozoon will contain many thousands of minute eggs.

3. The escaped flukes do not exhibit powers of locomotion sufficient to prove them capable of undertaking an extended migration, but their movements may subserve the purpose of concealing them within the grass or soft soil where they have fallen.

4. The eggs can only escape from the oviduct of the entozoon one at a time; but there is every reason to believe that large numbers of loose ova are expelled from the infested sheep in the same manner as the flukes themselves.

5. By the dispersing agency of winds, rains, insects, feet of cattle, dogs, rabbits, and other animals, and even by man himself, the eggs are carried in various directions, not a few of them ultimately finding their way into pools, ponds, ditches, canals and running streams.

6. The freed eggs, if mature, contain ciliated embryos capable of active progression, when brought in contact with dew on the blades of grass, rain-drops, pools of water, ponds and lakes. The prolonged action of moisture without, aided by vigorous movements of the perfected embryo within, serves to loosen the lid-like end of the egg-shell by the opening of which the animalcule is set free.

7. The ciliated embryo, or *proscolex*, as Van Benden calls it, contains within itself a solitary germ, which is developed by a process of internal budding into a non-ciliated larva or *scolex*.

8. The ciliated embryo, after swimming about for a time, sooner or later selects and attaches itself to the surface of the body of a pond snail or slug, or the soft body of some aquatic insect. In this situation it soon looses its ciliated covering, and subsequently gains access to the interior of the selected host.

9. Once within the viscera of its host the embryo disappears, leaving the hitherto contained germ-bud or scolex to undergo its further development, which is accomplished rapidly, a second progeny being at the same time formed within its own interior.

10. The enlarged and independent scolex is now transformed into a large sac or cyst, for the support and protection of its contained progeny. In this condition it is frequently called a

"nurse" or "sporo cyst," and when rather highly organized is known by the title of "redia."

11. The nurse progeny, or trematoda larvæ, thus produced within the scolex, are usually furnished with tails, and when fully developed are the well known cercaria. Van Benden calls them pro-glottides.

12. The cercaria have a tendency to migrate from the bodies of their molluscan or insect hosts, and they are quite capable of an independent existence. During these wanderings in the water, or in moist pastures, they are occasionally brought in contact with the human body, and in some instances appear to have succeeded in penetrating the skin.

13. It is not certain whether the cercaria are taken into the bodies of quadrupeds when the latter are drinking water or eating solid food, but it is probable they are transferred in either way. It is not unlikely that they are often swallowed while still within the bodies of their molluscan or insect hosts.

14. From the digestive organs of sheep or cattle the cercaria bore their way through the tissues into the liver, in which situation they part with their tails, and become encysted. This constitutes the so-called *pupa* stage.

15. The pupa thus encysted for many weeks or even months attains a higher organization, at last becoming converted into the sexually mature fasciola hepatica. It then gains access to the liver ducts, passes into the common biliary outlet, or ductus communis choledicus, from thence is transmitted into the intestinal canal, being finally expelled from its vertebrate host in the manner previously described.

An elaborate treatise on this parasite is "De la Reproductions chez les Trématodes endo-parasites, par J. J. Maulinié. Extrait du tome iii. des Memoires de l'Institut Génévis."

Dr. H. A. Pagenstecher, of Heidelberg, says, on this parasite: "We are again encouraged to take up our hitherto fruitless searchings among land snails, and we hope, with M. Maulinié, that the next steps in this direction will clear up the history of the development of distoma hepaticum."[1]

---

[1] See, also, Die Menschlichen Parasiten und die von ihnen herrührenden Krankheiten. Von Rudolf Leuckart. Leipzig: 1863.

We must now consider the second division of our subject, viz.: Gaseous, vegetable or mineral poisons absorbed or taken into the system of animals, and so contaminating their flesh or milk as to produce disorders in persons partaking of either.

Milk Sickness; The Trembles.—For many years past a disease has existed, in the newly settled districts of the West, confined to horned cattle, and not in the first degree affecting hogs or sheep. Although this disease has been known for many years and has at times been very prevalent, it has not been determined to what cause we may attribute it. The disease may exist in either an acute or chronic form, but the chronic form is that most frequently met with. In the chronic form of the disease there is frequently an absence of any very marked symptoms, and all that will be noted is that the animal looks dejected; this state will continue, and the animal will be affected with a lingering disease, prolonged sometimes for months, and then causing death on any sudden exertion; or sometimes it leaves the animal in an enfeebled condition for a whole season, from which it recovers slowly, and with a susceptibility to an attack of an acute form of any prevailing disease. The best description I have met with of the post mortem appearances of cattle dead with this disease is that given by Dr. Tolland. "The contents of the third stomach were dry and hard, its mucous membrane dry, and seemed to adhere to the alimentary mass, with which it would come away, though it did not appear to be mortified. The mucous membrane of the small intestines was in some places dry and in others greatly injected with blood; their contents were hardened; they were not distended with gas. The gall bladder was filled with dark, pitchy bile. In some cases the kidneys were nearly black, and appeared to be gangrenous. On opening the carcasses (before putrefaction had commenced) an offensive odor was emitted, not unlike that attendant on a mercurial salivation."

This disease exists only in newly settled districts, and disappears as the country becomes well cultivated. Dr. Drake supposed it to be produced by the cattle feeding on the leaves and tender twigs of the rhus toxicodendron, and his arguments in favor of this plant being the cause of the disease are cer-

tainly better founded than any other theory that has been offered.

Dr. Sutton supposes it to be entirely of malarious origin; but that is entirely out of the question, as cattle upon the same farm, kept in a different manner, are entirely free from the disease.

Dr. Seaton supposes it to be caused by "arsenicated pyrites;" but Dr. Owen positively declares that, from experiments he has made, he has never discovered arsenic or any other poisonous metal in the regions where the disease prevails. The disease of which we are here treating is unlike in all its symptoms to poisoning by arsenic.

Dr. Owen attributes the disease to the astringent salts in the waters, such as the chloride of magnesium; but the disease disappears under cultivation of the soil, though the mineral constituents of the waters remain the same; and others who have analyzed the waters say that many of the springs, where the disease is the worst, contain no chloride of magnesium.

But, whatever may be the cause, the disease, as we before said, exists in both an acute and chronic form. An animal suffering an acute attack has a sickly, dejected and forlorn appearance; it is disinclined to move; it eats but little, if at all; its breath smells badly; the bowels are most generally constipated, and the urine is dark colored and scanty. If an ox in this condition is put into the yoke, it will drop down dead at its work; and if the flesh is eaten by either man or animals, it always produces sickness and frequently death. And yet about the animal there are no post mortem appearances to account for death; in some instances all the morbid changes that have been noticed are a dryness and redness of the mucous coat of the intestines, and a congested state of the kidneys. If a cow in this state is milked, and the milk fed to man or animals, it always produces sickness, and frequently death; and yet there is nothing in the odor, the taste, or chemical or microscopical characteristics of the milk to account for these results. The products of an animal with the chronic form of the disease are equally dangerous, though the animal may not show any very marked symptom of the disorder. But such animals cannot bear violent exertion, so that it is

customary before killing an animal to drive it furiously for some time; if it has not the disease it is not injured by this driving, but if it has it generally drops down dead.

The milk, butter or flesh of animals suffering from this sickness, either in the acute or severely chronic form, causes a prostrating sickness if eaten by man, and if he recovers from its first effects he is left in a sickly condition, and will frequently for years, or for the balance of his life, complain that he has never fairly recovered. A very full description of this disease is given by Professor Drake, in the *Western Journal of Medicine and Surgery*, vol. iii.

From all the facts elucidated by those who have studied this disease, it appears to me that it must be attributed to vegetable origin, and possibly to the effects of the rhus toxicodendron, as asserted by Dr. Drake; we will admit that it is peculiar in its character, but that it produces a specific effect. Thus we have a vegetable poison absorbed into the system of an animal, causing sometimes an acute and at other times a chronic form of disease, and producing morbid changes; and, so long as the disease lasts, producing the same symptoms in man or animals that partake of either the flesh or the secretions. From these effects we may draw deductions of the effects of other vegetable foods which produce less marked effects than those here spoken of—less in degree—seldom inducing immediate death, or even a marked sudden sickness, but causing a lingering malaise that lays the foundation of ill health of both mind and body.

It has been known for many centuries that goats, sheep and horned cattle, and even birds and fish, may eat with impunity to themselves some of the narcotic vegetables, but that at such times both their flesh and milk (of those giving milk) are injurious to man. As I have referred to Dr. Drake's lengthened description of the symptoms of this disease I will give but one case in point, and will confine myself almost exclusively to the words of the observant and intelligent gentleman who related it to me. He said: "I was traveling on horseback, and felt unusually well, when I partook of the flesh of one of these diseased animals, while stopping for dinner in Indiana. After dinner I proceeded on my journey, but in about three hours I

was troubled with nausea, followed by a faint, prostrating vomiting, with diarrhœa and cramps in the legs. I stopped, and a physician was immediately sent for, who recognized the disease as 'milk sickness,' with which he was well acquainted and had treated many cases. I ached to the very marrow of my bones, and the vomiting, retching and prostration, which lasted more than a week, so enfeebled me that I could not stand. About this time I had a bed placed in a wagon to take me home, but the journey was a most painful one, as I could not move a hand to help myself without a feeling of faintness. Although under good medical treatment, I lingered in a prostrate and enfeebled condition all winter. My bowels were usually costive, but diarrhœa frequently returned upon me. I could do nothing, either mentally or bodily. In the spring I wandered occasionally out of doors, but could do no work, as the slightest exertion so overcame me that I became faint; and I am satisfied that had I persisted in my efforts at labor I should have died suddenly, as the ox that is worked while laboring under the same disease dies in the furrow. I gradually got about, but I have never since that sickness recovered my strength."

Ably as Dr. Drake has discussed the probabilities of the *rhus* being the cause of this disease, we cannot but acknowledge that those who doubt the correctness of his opinion have strong ground for so doing, if they may judge by the known action of other vegetable poisons. Most of the poisons with which we are acquainted produce their effects soon after they are taken, and within a few days at the utmost these effects pass off. This is not the case in the disease we are treating of; it is the very reverse of this, as the poison, whatever it may be, lingers in the system of the animal for months, and within all that time produces the peculiar sickness in man, if he partakes of the milk or meat of the diseased animal. We cannot but acknowledge that it is a poison producing different symptoms from any other with which we are acquainted; but we must not reject facts which a man so eminent and earnest as the late Dr. Drake collected by diligent study, because we who have not searched have not met with like instances.

It is asserted by farmers, though I believe it has not been

confirmed by physicians, that the "buckeye," the "æsculus ohioensis," produces a similar disease, if eaten by cattle, to that above described, but that neither the flesh nor milk becomes unwholesome to man. From some few observations I have made, I think this is not a proper description of the symptoms produced on cattle which eat this kernel. The buckeye is an astringent narcotic, producing giddiness and symptoms like intoxication, and followed by severe constipation of the bowels. The effects generally pass off in three or four days.

Whatever the poison may be that produces this "milk sickness" or "trembles," it is peculiar in its effects, and from the mass of evidence received it must, I think, be attributed to some vegetable poison, producing a disease similar in degree to some of the animal poisons. We may take the single one of pleuro-pneumonia in cattle, as an instance. Here we have a disease which is mostly chronic in its character, but from numerous well authenticated instances the flesh of such animals, if eaten by man, produces carbuncles, and the diseased animal does not recover its health, and is capable of communicating the infection for many months.

I cannot dwell upon the treatment or post mortem appearances of this disease, my object at present only being to point out some of the diseases in cattle rendering their flesh or secretions injurious or poisonous to man. There are persons who have asserted that the disease here spoken of is not produced by eating diseased meat, but is nothing more than the "continued fever" of the West; but such assertions I deem utterly foolish, and at variance with the recorded facts of able and eminent physicians, at variance with the "mortality tables," and utterly different in its invasion, symptoms, duration and treatment to continued fever. Of the "*toot poison*" I will speak at another time.

I can also but barely mention other vegetable and mineral poisons which may disease the flesh or milk of animals, and render them unfit for food for man. Medicinal agents of various kinds are frequently administered to cattle; we are, to a great extent, utterly ignorant whether they produce deleterious effects upon the flesh. Various parasitic vegetables are found within the organs and muscles of animals; we are

but little instructed as to the effects they produce on man if he eats the animal flesh in which they grow.

But there is one cattle disease extraordinarily prevalent around most of our large cities, which, according to well authenticated statements, induces large human mortality, especially amongst the infant population. I speak of what is known as—

The Distillery Poison.—For many years past, wherever distilleries have been erected around large cities a large number of cowsheds have been built adjacent to them, that the cows might consume the distillery waste, and thereby increase their quantity of milk. This traffic has been found highly profitable, and I am informed, by a gentleman who has taken an unusual interest in this subject, that there are at the present time about seven thousand cows fed upon this distillery waste upon that small portion of Long Island immediately adjacent to New York. More than twenty years ago the deleterious quality of the milk from these cows was noted, and strenuous efforts were made by philanthropic individuals to caution the public against its use. This effort has been revived again and again, but in spite of all, the traffic in this diseased milk and meat has largely increased. It is impossible to inform an ignorant public, and legislation alone can reach this plague spot. By reference to authorities I find, amongst other works upon this subject, two reports to the New York Academy of Medicine, which plainly prove, by cases given, the highly deleterious quality of this milk as food for infants. Numerous cases are here given, plainly proving that slow, lingering marasmus and death have been the fate of infants fed upon this milk. By other persons the meat is stated to possess no better properties.

In a report made to the Board of Health of New York, in 1858, an analysis of this distillery waste, the food of these cows, is given by Professor Doremus and Dr. Chilton; and this analysis is most closely scrutinized, and its component parts most plainly shown in comparison with other food, by the author of this essay, in the report to the Academy above mentioned. The author further states, in relation to this distillery poison as food for cattle: "Before distillation takes

place fermentation is induced in the grain and its whole character is altered, and the starch and sugar are converted into alcohol, leaving very little of these nutritive products behind. Nor does fermentation stop here, but it is continued after it leaves the still, and even in the state in which it first reaches the animals it is sour, owing to the formation of vinegar by prolonged fermentation; and as it stands before the animals it is constantly growing sourer and assuming another fermentation process, that of putrefactive fermentation, which again creates another and different change in the original character of the grain. We have not, then, in this swill what is usually present in ground corn and other grains; but the grains have undergone vinous, acetous and putrefactive fermentation, making them insufficient to support the life of an animal in a healthy state. Each of these different kinds of fermentation deprives the grains of their nutritive qualities, and the two last make unhealthy additions." Again, this bad food of the cows "changes the quality of the milk, altering it from its normal character, and imparting to it properties that healthy milk does not possess." Numerous analyses are given to prove this fact.

The meat from these swill-fed animals is peculiar in its character. My report is fully corroborated by butchers and others with whom I have conversed upon this subject. All agree in saying that it is unusually soft and flabby; that the fat does not harden readily; that it has a peculiar acid, distillery odor; that it shrinks very much in cooking, and is more tender than other meat. We have very few facts to guide us as to the effects of this meat upon persons eating it, but I have one case in point. In the month of June, 1863, a piece of beef was on my table that had a peculiar flavor. I ate it sparingly, and noticed the peculiar swilly odor and taste, with which I was well acquainted, having acquired this knowledge in student life at Bellevue Hospital, where the fact of supplying us with "swill beef" was not pretended to be concealed. I ate for my lunch bread and this meat only. It produced a most profuse and persistent diarrhœa, with a feeling of general malaise. On the third day after eating it, I was taken suddenly sick while in the street, and my left shin pained me very severely. On my

return home, I found an inflamed spot, about three inches in diameter, and in the centre of this two pustular elevations, each about the size and color of a split pea. The next day the whole inflamed surface had become a vesicle. Eventually the whole skin peeled off and the two pustular spots became deep-seated ulcers; six weeks elapsed before they were perfectly healed. The whole spot is yet of a dark color. These distillery cattle are also nearly all afflicted with pleuro-pneumonia.

THIRD DIVISION—Animal poisons which render the flesh or milk of animals unfit for human food.

Cadaveric Venom.—Some deleterious principle is developed in an infuriated or over-driven animal which renders the flesh dangerous as food, and poisonous if wounds are inflicted while cutting up the carcass. Butchers, in cutting up healthy meat, frequently cut or scratch themselves with the knives, and no evil results follow; but if a wound is inflicted while dressing one of these over-excited animals, symptoms are produced similar to the well known "dissection wound." If the flesh of these animals is eaten, it produces violent dysentery and great febrile excitement. Numerous cases might be cited in proof of these statements. Such flesh is not allowed to be sold in the European markets.

The milk of goaded or infuriated animals is equally deleterious as that from a passionate woman.

The *parturient fever* of animals also renders their flesh utterly unfit for human food; in fact, many deaths are reported in the European journals, well authenticated, as produced from this cause alone. It is acknowledged that in the human female great similarity exists in the cadaveric poison and the puerperal. The secretions of an animal suffering with parturient fever produce almost similar results upon the hand or arm of the accoucheur as that produced by a human female in the same disease. Although the flesh of such animals produces such marked and easily traced sickness, it cannot, when dressed, be distinguished by any known appearances from that from healthy animals. There is a law in England against selling such flesh.

Epizootic pleuro-pneumonia.—This disease has peculiar interest to us, as it is one that has prevailed in some parts of the

country to a considerable extent. Few can forget the extent to which it prevailed a few years ago in Massachusetts, and the peculiar malignancy and fatality of the disease. The people became alarmed, and an extra session of the State Legislature was called. Steps were immediately taken to elicit information, and commissioners were appointed by the Commonwealth with full powers to eradicate the disease. The State and the people freely offered their wealth to prevent it from spreading to other States. The whole Union owe a debt of gratitude to Massachusetts for the efforts used and the money spent to prevent the diffusion of this disease. It is much to be regretted that it still exists in isolated localities within the State, and it is more to be regretted that this is due to the timidity of the commissioners, who had full power to exterminate the disease.

The commissioners appointed by the State of Massachusetts visited other States to endeavor to learn something of the disease, and they reported that it existed to a large extent in the distillery dairies around Philadelphia, Bordentown, Brooklyn and Williamsburgh.

It is stated by Professor Gamgee, in England, and by Mr. Charles L. Flint, and all who have studied the disease here, that it never originates spontaneously, either in England or this country, but is always due to importation. It is essentially a contagious disease, so contagious that very few animals escape the disease that take the breath of an infected animal. In the first breaking out of the disease in new districts, by bringing in diseased animals, it is quickly and fearfully fatal, but becomes after a while more chronic in its character. It is a disease of the lungs; spots of various sizes become hepatized and partially encysted; sloughing takes place; the whole lung becomes disorganized, if the animal does not sooner succumb under the influence of the poison.

To form some estimate of the violence and extent of this disease a few facts might be mentioned.

A few years ago a bull, suffering with the chronic form of pleuro-pneumonia, was sent from Holland to the Cape of Good Hope. He infected the animals there with which he came in contact; they spread the disease to other herds, and as all the

carrying trade there is done with ox teams, in this manner the disease was carried almost all over the country. The result was that cattle died, not by hundreds or thousands, but by millions, and the business and prosperity of the community was ruined. The disease was only stayed from spreading over a large extent of country by most rigid non-intercourse.

Over a million head of cattle have died in England from pleuro-pneumonia in six years, and Mr. Flint says that the mortality is largely on the increase.

Mr. Charles L. Flint has written a most admirable letter on pleuro-pneumonia to His Excellency Gov. Andrew, of Massachusetts, calling attention to the startling facts he brings forward, and of the continued existence of this disease amongst our cattle. It is acknowledged that it exists in all our large "town dairies." With these facts before me, is there not a necessity of asking the question I have propounded at the beginning of this subject, "*What effect has the meat or milk from diseased animals upon the public health?*"

Mr. Flint, in this letter on pleuro-pneumonia, says: "In one week, about the time I was in London, more than nineteen tons of diseased meat were discovered in that market alone. These are startling facts, but they do not represent the whole truth. They fall far short of it, for we must consider the contamination of the animal food and of the dairy products of the kingdom, and the almost universal demoralization amongst a very large class of farmers, dealers and butchers, affecting the whole community, consequent on the reckless traffic in diseased meat." Again he says: "If the people are willing to drink the milk of cows rotten with disease and to give it to their children, as they have done in Boston; if they are ready to accept the alternative of having the beef of diseased animals brought upon their tables, as has been the case, I have no more to say. But if they desire to avoid this alternative, they will have to act promptly and strenuously for the eradication and stop of pleuro-pneumonia."

"The New Hampshire State Pleuro-Pneumonia Commissioners report that they have found the disease in cattle in Dublin, Nelson, Antrim, Peterboro,' Sharon, Hancock, and Jaffrey; that the number of animals slaughtered by the commissioners

is thirty, and their appraised value $386; that the history of the disease in the State is traced back with minuteness to Mr. Chenery's unfortunate importation from Holland, in 1859; and, finally, that the disease is contagious and not epidemic, and that its spread should be carefully restricted by stringent legislative enactment."

Professor Gamgee says: "My opinion is confirmed that the flesh of cattle affected with pleuro-pneumonia, when eaten by man, induces boils and carbuncles to an incredible extent."

"Diseased animal food has affected the health of the people to an extent becoming more and more appreciated the more the subject is investigated."

"The tens of thousands of carcasses of diseased animals, sold in large towns, are stealing life from human beings when and where we least expect it."

"It is altogether a mistake to believe that diseased meat is sold to the poor. There are many diseased cattle eaten whose real state could only be told at the time of slaughter."

"Dr. Livingstone, in his 'Travels in Southern Africa,' asserts that if the flesh of animals which die of pleuro-pneumonia is eaten, it causes carbuncle in the persons who eat it."

In the third detailed report of the Registrar-General of Scotland, in speaking of diseases of the skin and the integumentary system, he says: "The object in noticing this class of diseases at all is to direct attention to the fact that, ever since the outbreak of pleuro-pneumonia among the cattle of this country, carbuncle, a disease formerly very rare, has become comparatively common. Thus in 1848 and 1849 the deaths from carbuncle all over England were only 91 and 81 respectively. Pleuro-pneumonia appeared among cattle the latter end of 1849, and the deaths from carbuncle in the human subject numbered 134 in 1850, 161 in 1851, 233 in 1852, 252 in 1853, 300 in 1854, 255 in 1855, 253 in 1856, 252 in 1857. Many may ask what connection has carbuncle in man with pleuro-pneumonia in cattle? And the question could not be answered satisfactorily were our observations to be limited to what has been observed in this country. But the connection is of the most intimate kind, and proved by evidence which we cannot resist. The Rev. Dr. Livingstone, in his 'Travels in

Southern Africa,' mentions the fact that if the flesh of animals which die from pleuro-pneumonia is eaten, it causes carbuncle in the person who eats it. He asserts that neither boiling nor roasting the flesh, nor cooking it in any way, gets rid of the poison which produces this effect; and that these facts have been again and again proved relative to all the tribes of Southern Africa. Who, then, can doubt that this is the very same cause which has produced that large increase in the number of deaths from carbuncle which has been so strikingly manifested in England within the last twelve years? Facts are wanted to show what is the proportion of cases to deaths. Probably not one in twenty is fatal." "Is it not within the bounds of possibility that that new form of disease which we term diphtheria may be partially induced by the use of diseased flesh? The subject, at all events, merits attention."

In a report made to Mr. John Gamgee upon the "Health of Stock" in England, by Dr. James Rendle, is the following language: "Many diseased animals are slaughtered as human food, and it is said that they are eaten by the convicts of Portland, amongst whom boils and carbuncles are prevalent disorders, amounting, at times, to forty and fifty cases a month, out of one thousand five hundred individuals. Other causes may contribute to the development of these carbuncles, but we know that they constitute the very diseases attributed to the consumption of unwholesome meat."

This strong and emphatic language, used by the Registrar-General in his report to the British Government, fully answers (with this disease) the question I have asked; *it unhesitatingly points to sickness and death as the effect produced by eating diseased meat.* In this, as in other diseases of cattle I have here treated of, there is some peculiar (and as yet to us mysterious) law, which makes us inherit the maladies of those animals whose flesh we convert into our own bodies, and frequently brings us to the same death.

It seems to us that the physicians as well as the people of this country are perfectly apathetic about this disease. It exists amongst us to a very fearful extent, and is liable at any time to extend its ravages, by simple importation, to fresh and healthy neighborhoods. Mr. Flint, in his able letter above

quoted, to Governor Andrew, says that the disease still exists in that State to a great extent.

The commissioners appointed by that State acknowledge the same fact. They say, also, that in Bordentown, New Jersey, "the disease had evidently become an *institution*," and that one man had "lost his entire herd of sixty cattle." They say that the same disease exists in all the large town dairies of Philadelphia *and Brooklyn*, and that it has existed there since 1850, annually carrying off large numbers of cattle.

The commissioners use this language regarding the cattle in the Bordentown stables: "In the mean time they (the people) must drink the milk and eat the meat of animals whose inflamed or putrid lungs cannot supply the due and healthy proportion of oxygen to the blood." But it is to be regretted that in a previous sentence they say to the farmers of their own State, "fatten the cattle, if you can, for beef."

With regard to the milk from cows suffering from pleuro-pneumonia, Professor Gamgee says: "It is often in excessive quantity in the incubative stage. When cough and a slightly checked secretion are observed, if an animal is slaughtered, a lung may be found already extensively hepatized. For a few days the milk continues to flow. It is altered in quality, poor, and apt to curdle. It often contains pus and even blood."

In the report to the New York Academy of Medicine, above quoted, I have given a microscopic drawing of the milk from a cow suffering with this disease. It contains pus in large quantities, blood, and peculiar confervoid bodies; and the milk from this cow, from which the analysis was made, was altogether different in its component parts from healthy milk; it was acid, also, to test-paper, when first drawn. Thus we have all authorities whom I have quoted agreeing as to the unwholesomeness and unfitness for food of the meat and milk of animals suffering with this disease. And yet large amounts of both such meat and milk are offered in our markets from all the distillery stables around the city. I pretend to offer no remedy for this great evil; it must suggest itself to every thoughtful mind.

There is a disease amongst cattle in England known as *anthrax* or quarter ill; the same disease exists in sheep, and is

then known as braxy. The disease is more severe in Germany, and is there known as *miltzbrand*, and also in France, where it is called *fièvre carbonculaire* It exists, I am told, to some extent in this country, but I have no personal knowledge of it. Very numerous instances of sickness, poisoning and death from using the meat and milk of animals suffering from this disease are on record, as well as death from skinning the carcasses or inflicting wounds while cutting up the meat. But I cannot spare time at present to give details of these interesting cases; it would be but mere compilation.[1]

Eruptive Fevers.—Under this head I can refer at present to but one malady, viz.: Epizootic aphtha, vesicular epizootica, eczema epizootica, murrain, foot and mouth disease, *maul u klauenseuche* of the Germans, *la cocotte* of the French.

The symptoms of murrain in cattle are first indicated by general fever, diminished appetite and disinclination to feed, unwillingness to move, and consequent separation from the rest of the herd. The general fever increases, and an eruption appears, vesicular in its character, chiefly upon the foot between the digits, upon the dental pad extending over the buccal membrane, upon the side and surface of the tongue, sometimes covering that member; frequently the eruption may also be found upon the thighs and upon the inside of the udder; occasionally it is found upon other parts of the body, and extends to the œsophagus, stomach, and intestinal canal. In favorable cases the vesicles disappear in a week or ten days; where they last beyond this time the fever becomes typhoid in its character, and fatal terminations are not unfrequent.

As a general rule this disease affects the same animal but once in a lifetime. The vesicles within the mouth frequently break early, and a large quantity of frothy saliva, mingled with blood, is discharged from the abraded surfaces and the inflamed state of the salivary glands. Lameness is always present, sometimes before the appearance of the vesicles, but always after the vesicles are to be seen. In animals that are giving milk the inflammatory vesicle is frequently found upon the teats, extending up the ducts to the glands, causing struc-

[1] For a full description of Anthrax, in all its variety of forms, see Traité des Maladies Charbouneuses, par L. A. Raimbert. Paris: 1859.

tural changes in the udder. When vesicles form within the teats, pus may nearly always be found in the milk. This disease occurs in horned cattle, sheep and pigs, and is generally more fatal to young animals than to older ones. It is most fatal to the female animal just before parturition.

Of treatment I need say but little. I have seen this disease existing in almost every animal of a large flock of sheep, and under the following treatment it did not prove fatal in a single instance. A long, narrow trough was placed in a narrow place between two fences, where one sheep only could pass at a time. In this trough finely cut straw was placed, which was well wetted with a solution of sulphate of copper. Each animal was compelled to walk through this solution night and morning. The mouth of every animal was inspected, and washed with a sponge on the end of a small, strong stick, moistened with a solution of sulphate of copper. Bran, which had a small quantity of soda mixed in it, was fed every night, and the sheep were kept dry. I briefly mention this to show how much benefit a little treatment may do.

I have seen this disease in its worst form in our town dairies, the animals being exceedingly lame and loth to stand up from the soreness of the feet; the tongue in several instances I have seen extruded and covered with aphthous sores, and large quantities of saliva pouring from the mouth; vesicles which had passed into ulcers existed between the thighs and the udder; vesicles and ulcerated spots (ulcerated in consequence of the abrasion of the vesicles from milking) were numerous upon the teats. The teats were swollen and tumid, and the milk glands enlarged and hardened. I have seen pus in large quantities in milk drawn from these animals, with blood corpuscles, and a peculiar yellow corpusculoid mass, larger than a pus corpuscle, and of a yellow color. I have also seen confervoid bodies in this milk. The French physicians and veterinary surgeons have studied this disease (cocotte) very intimately, and most admirable drawings are given of the appearance of milk from animals badly diseased, in the Transactions of the French Academy of Medicine. Many plates are there given, exhibiting the milk much altered from a healthy state, and showing confervæ, pus, blood, and granu-

lated corpuscles. In the Report to the New York Academy of Medicine, to which I have before alluded, I have given drawings of milk from "an animal covered with sores," similar to that I have just spoken of. This soreness of the feet must not be confounded with that caused by these stump-tail cows standing on the hard floors till their feet are sore and deformed.

The word *murrain* has been used for almost every form of disease existing amongst cattle. Virgil, in his Third Georgic, speaks of a murrain that was most fearfully contagious in its character, that existed about fifty years B. C. But the word murrain should not be used to express this disease of which we are at present treating, unless with the prefix vesicular. It is highly contagious in its character; contagious not only to animals of the same species, but to nearly all domestic animals, *and also to man.* It is contagious to man not only by the serum that exudes from the vesicles, but by the saliva that flows from the mouth, the milk, and, to some extent, the meat.

Dr. Nauheimer published an inaugural dissertation at Giessen, in 1860, on the poisonous nature of milk in epizootic aphtha. He gives a full descriptive history of the complaint, and has collected the reports of innumerable cases of poisoning, producing great sickness and occasionally mortality from use of milk from animals suffering from the disease. I find cases also scattered through our medical and veterinary journals of like results—cases too numerous to mention here, but confirmatory in the strongest manner of the injurious quality of the milk from such animals to human beings and to animals to which it is given.

We have but few recorded facts of the injurious quality of the flesh of such animals for human food. Prof. Gamgee says, on this point: "I think it desirable that attention be paid to this disorder by medical men." Dr. Balfour, of Edinburgh, in speaking of this disease, says: "The whole question of the use of diseased meat for food is one of too great importance and of too vast proportions to be entered on" carelessly.

The flesh of cattle and of sheep affected with small-pox is stated by many persons not to be unhealthy, but is highly con-

demned by others. Delafond says the sale of it should be condemned. It is not allowed in France and England.

The contagious typhoid fever poison, or rinderpest of Southern Russia, is at present entirely unknown amongst us. It is this disease which at present prevails to such a fearful extent in England. The author of this essay furnished to our able Secretary of State, Mr. Seward, facts proving the contagious nature of this disease, and by Mr. Seward's influence a law has been passed prohibiting the importation of cattle into this country until this plague has disappeared from Eastern Europe.

I can at this time give no information upon this subject, as I have not condensed the numerous extracts I have made from the scientific journals of Europe, but I hope at some future time to condense this subject into a separate monograph.

For the effects of the meat and milk when eaten, I would refer to what has been before said on pleuro-pneumonia.

I have thus skimmed over, in a very hasty manner, some of the diseases to which cattle are subject, and the effects of their meat and milk while in a state of disease upon human beings who consume them. I have necessarily been very brief, and I feel sorry to leave incomplete many interesting points which might have been amplified, and thus have been more interesting and instructive.

I must now consider the whole subject in its general bearings.

It would seem almost an insult to common sense to ask the question: Is it better to protect a whole nation from disease, or cure those who become diseased? And yet almost the whole nation, Senate, Legislators, Board of Health, and the people, answer affirmatively the latter part of this question. Many, very many physicians are no better informed upon the important subjects I have briefly discussed than the people. It is with the hope to bring the whole subject of diseased animal products to the scrutinizing attention of the profession that I have written these few pages. The profession to which I belong need no incentives to urge them to study, for as soon as new fields are opened to them, earnest explorers are diligently searching for new discoveries. The maladies caused by diseased animal products have as yet been but little studied

here; but as the attention of the profession is called to the number of diseases existing amongst animals which, in turn, plainly and directly deteriorate the health of the people, we shall have as earnest investigators in this branch of science as in other branches.

Much attention has been given in Europe of late years to the investigation of entozotic diseases, and the researches of Küchenmeister, Röll, Leuckart, Von Sieboldt, Van Beneden, Fleming, Gamgee, and many others, have thrown a flood of light upon this subject. Of the poisonous nature of milk from diseased cows, Nauheimer, Jacob, Hertwig, Donné, Spinola, and a host of others in Europe, and a few in our own country, have given us facts beyond the possibility of controversy. Of the effects of diseased meat upon the public health, Gamgee, Lethely, Taylor, Simon and others, have made it one of the most interesting and important subjects of sanitary science. Leidy, of Philadelphia, has contributed largely to our knowledge of the fauna and flora within living animals. With such a host of investigators, this branch of sanitary science ought to be more deeply studied amongst us. It need not be for want of subjects to which we may direct our investigations. Flint states that pleuro-pneumonia exists to a fearful extent amongst us, and deems the subject of such importance that he calls the attention of the Governor of his State to the facts he lays before him. Drake died after laborious investigation on the subject of "milk sickness," without being able to offer a remedy. The disease still exists to a great extent in many of the newly settled districts of the West. Epizootic aphtha exists through the length and breadth of the land. Fearful scourges of hog cholera frequently carry off thousands of swine in a few days. There are frequent epidemics of the rot in sheep and epizootic disease in lambs, similar to that described by H. S. Randall in 1862. Distillery milk is more largely sold and kills as many children as it did before Leslie's exposures and the author's researches. Tæniæ solium never were so prevalent as now, and trichinæ are known to be an "institution" amongst us! *What is "spotted fever?"*

In studying all these diseases which infest oxen, sheep, swine, and other live stock, we have peculiar facilities for prosecuting

our investigations; that great assistance to modern scientific research, experiment, is open to us, and affords us facilities that cannot be obtained in studying diseases in the human subject. Many maladies that are fatal to man can undoubtedly in this way be traced to analogous diseases in animals; and many obscure maladies, the causes of which are now unknown to us, may, in such investigations, find a ready solution. What is more likely to cause disease in us than converting the flesh of animals that we eat into our own bodies, and are we not thus liable to be involved in the same maladies with which they are troubled? There is no field of scientific research which would give a richer harvest than plainly mapping out the effects of epidemic, infectious, contagious and parasitic diseases of animals upon man. A little has already been gleaned in this line, but the harvest has yet to be garnered.

There is one other aspect to this subject which is of vital importance to this nation. I mean the *moral aspect.* No people can be *moral* who deal in any way in diseased animal products; and I do contend that bad food, as well equally as bad air and insufficient light, tend strongly to demoralize the minds of a people. Much might be said upon this aspect of the subject; but I would rather practice to lessen the evil, and leave the preaching to those who can do it better.

I am satisfied that these diseases have not only become better known amongst us, but have increased largely, chiefly by importation, within the last few years.

A remedy is needed for the evils I have here slightly portrayed. Will medical men educate themselves sufficiently upon the subject to know what remedy to ask for?

In treating on the various diseases of cattle that I have noted in this essay, I have often shown the injurious effects of diseased meat and milk upon persons using either of them; a few quotations from other investigators would perhaps be most to the point here.

Professor Gamgee says: "We can refer to violent attacks of dysentery, to malignant pustule, mysterious and fearfully sudden deaths, resulting from the consumption of impure animal food; but we know not to what extent and in what way it aids in constantly raising human mortality, what percentage of deaths

must be annually attributed to the constant and unchecked traffic in the carcasses of diseased animals or the milk of foully kept or diseased cows. My conviction is strong that of all food adulterations, none operate so constantly and fatally as the deteriorations of animal products."

"The trade in diseased animals is opposed to our agricultural prosperity; such trade is ruinous to the nation."

"The consumption of diseased animal produce is as humiliating as it is unfortunate." "The traffic in diseased animals favors the development of human diseases."

In a communication read before the British Medical Association Dr. William Budd states, from deep and anxious study upon the subject, "that *malignant pustule* in man is identical with and derived from the fatal and eminently contagious disease which, under the name of '*charbon*' or '*sang*,' has prevailed for a long time on the Continent in oxen, sheep and other animals."

Dr. Budd gives the mode of communication and many cases in point.

M. Guilmot, in *Ann. de Méd. Vétér.*, gives two cases of the transmission of epizootic aphtha to the human species. Dr. Balfour, in the *Edinburgh Medical Journal*, also reports two cases. There are *numerous* cases of like character scattered through the medical and veterinary journals. *Jacob and Hertwig proved it upon themselves.*

Dr. Lethely has reported several cases of poisoning with fresh sausages made from the flesh of diseased cows. In one instance, "out of sixty-six persons partaking of the sausages sixty-four of them were made very ill. They were purged, became sick, giddy, and the vital powers were seriously prostrated, and they lay in many cases for hours in a state of collapse, like people with cholera. One man died." Upon analysis no poison of any kind could be discovered in the meat, but it was known to have been part of a diseased animal. Diseased meat has also been analyzed by Professor Maclagan and Dr. A. S. Taylor without being able to ascertain to what it owed its poisonous properties. Milk that is derived from cows afflicted with epizootic aphtha, splenic apoplexy, the trembles, pleuro-pneumonia, or distillery disease, and which has

produced its peculiar sickening effects upon human beings using it, has been found to differ but little in character from healthy milk. What method must we adopt to discover these latent, hidden, but active poisons?

Thus, in reviewing the effect of diseased meat and milk on the public health, we meet with peculiar difficulties in studying the two last divisions of my subject; we cannot as yet prove them all to be injurious except by the effects produced. In the numerous analyses of milk given by myself (*Trans. N. Y. Academy of Medicine*, vol. ii., part 4), amounting to some forty different analyses, I have gone beyond all others in proving that the milk from diseased cows differed in its chemical composition from milk from healthy cows, and that some of the ingredients of healthy milk seemed to be wholly wanting; but this is merely negative testimony, and does not prove the existence of any active poison, although it plainly proves the innutritious qualities of the milk. We do not meet with the same difficulty in studying the first division of my subject—parasitic disease. Here we have something that may be made visible, something that we can prove to be injurious in its effects. We have proved that the "measles" in the pig is the cause of tænia solium in the human subject; that the echinococcus in its imperfectly developed larval state, destroys thousands of human beings yearly; that a cellulosa in the calf becomes a tænia medio-canellata in the human intestines; that the trichina spiralis of the hog *and of the ox* multiplies in myriads in the stomach of man, and infests every muscle of his body with minute thread-worms, causing great mortality; the "sturdy" in sheep is an hydated form of the tænia cœnurus, and there are instances on record of human poisoning from this cause. There are numerous other parasites, the names of which I have given in the early part of this treatise, of which we know but little of the laws which govern their reproduction, but when they are investigated thoroughly may be found equally injurious to man as those which I have mentioned.

LANE LIBRARY

YMAGALI ZMAJ

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on or before the date last stamped below.

JUN 7 1921

Gaylord Bros.
Makers
Syracuse, N. Y.
PAT. JAN. 21, 1906

1604 Percy, S.R. 15629
P43 What effect has the
1866 meat or milk from dis-
eased animals upon the
public health?

G. Stevens JUN 7 1921
G. Stevens AUG 1 3 1921